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» » An Engineering Report « «
Dated A.D. 97

CLEMENS HERSCHEL, Honorary Member and Past-President of the Society, is dead. Bridge designer, hydraulic engineer, inventor, author, aggressive seeker for the truth, he passed away quietly at his home in New Jersey just prior to his 88th birthday.

His passing has been widely noted in the daily press and in technical periodicals, while Part I of Proceedings this month contains a résumé of the more notable events in his colorful career. Nearly all of these accounts mention his best known book, "Frontinus and the Water Supply of Rome", so that now appears to be an appropriate time to re-tell the story of that volume.

Q (Sextus) Julius Frontinus, an honored citizen of Rome, who lived from about A. D. 35 to about A. D. 103 or 104, was appointed commissioner of water works of the City of Rome in the year 97 by Emperor Nerva Augustus Caesar. Frontinus already enjoyed a reputation as an intelligent soldier and a worthy public official, so that this new appointment was based on proved ability. In fact, as a younger man, he had written a book on land surveying, showing that he had the requisite mathematical background.

Upon taking up the duties of commissioner, Frontinus began in true engineering fashion to collect the data on the job. He wrote down the history of each of the nine aqueducts, described the location of all of the incidental structures, together with their condition, outlined the principles of hydraulics as he understood them, described the Roman equivalent of the water meter, together with the perplexing problems of its abuse by dishonest plumbers or householders—in a word, he made a survey of conditions as a basis for future action.

The original "field books" are lost, but copies had been made, and copies of copies, one of which (made in the 12th, 13th or 14th century) has been almost miraculously preserved. "The world is plainly indebted for it solely to the labors of the pious monks of the Benedictine Monastery of Montecassino; the parent monastery, founded by Saint Benedict himself in the year 529."

Mr. Herschel had long been acquainted with this work in the form

(*Continued on page 4*)

The Oldest Member

THOMAS PEARSON KINSLEY has been affiliated with the American Society of Civil Engineers longer than any man now living. He was elected a Member, February 5, 1873.

A year ago the list of oldest members was headed by Clemens Herschel, who has just died, followed by William W. Maclay who died in June, 1929. Mr. Kinsley was third in that group and now heads the list.

He was born in 1845, was graduated from Dartmouth College in 1866, and has practiced as engineer or contractor on parks, railroads, canals, street railways, subways, and private landscape work. He retired from active practice in 1923, and now lives in Hamden, Conn.

Spring Meeting
Sacramento, April 23-25, 1930

THE choice of Sacramento for the Spring Meeting appears to have been ideal from several standpoints. Numerous places in the city and vicinity are of interest to engineers and the transportation facilities by rail, highway, or air are excellent.

The technical program presents subjects of wide interest and importance and there has been a broad choice in the selection of the engineers who will present and discuss the papers.

In addition to the general program which lists two topics of increasing National importance, there will be sessions of the Construction, Highway, Irrigation, Structural, and Surveying and Mapping Divisions, which are certain to attract members from many of the Western States.

The social features and entertainments likewise have been planned to be attractive both to visiting members and guests. Special effort has been made to entertain the ladies and make their visit to Sacramento one to be long remembered.

The meeting, which will open officially on Wednesday, April 23, will be preceded by meetings of the Board of Direction, a Local Sections Conference and a Student Conference, and will close on Friday with a boat excursion on the Sacramento River. For those who can prolong their visit, there will be a post-convention tour of inspection to the Southern Pacific Railroad Bridge under construction across Suisun Bay, or an alternate trip to inspect a number of large dams under construction in the vicinity of Sacramento.

Irrigation Division

By J. B. Lippincott
Chairman Executive Committee

DURING the closing months of 1929, a poll was taken of the members of the Irrigation Division asking for opinions on desirable subjects for investigation. Thirty-two replies received prior to January 1 are listed below, the first three committees being already in existence:

Duty of Water (particularly Consumptive Use)	5
Drainage	4
Ground Waters	4
Quality of Water	4
Flow of Water in Curved Pipes and Canals	2
Treatment and Use of Sewage for Irrigation	2
Operation and Maintenance of Existing Irrigation Systems	2
Possible Improvements in Methods of Observation of the U. S. Weather Bureau	3

The Executive Committee of the Division will consider the appointment of Committees on Flow of Water in Curved Conduits, Salvage of Sewage, and Possible Improvements in Methods of Observation of the U. S. Weather Bureau.

Nine replies favor the publication of Irrigation Manuals, but 7 oppose it. Eighteen desire that working committees be small, with their members living near together so as to permit easy conferences. Only 3 members want large committees.

Other interesting suggestions were an impartial engineering study of a reasonable division of the water of the Lower Colorado, spray irrigation, conduit design for economic working range of associate equipment, petitions to the Federal Government for expediting Hydrographic Reports and for larger stream gauging appropriations, and compilation of life of various classes of irrigation structures.

There were also comments on the overlapping and lack of definition between the work of the Irrigation Division and that of the Special Committee on Irrigation Hydraulics (which reports directly to the Board of Direction). In connection with this matter, the Board in January adopted a budget item which will permit a joint meeting of the Committee on Irrigation Hydraulics with the Irrigation Division Executive Committee at the time of the Sacramento meeting, to discuss their possible amalgamation.

The main items of the Sacramento session of the Division were listed in the March *Proceedings*, Part 2, and the complete program will shortly be in the hands of all members of the Society. A large attendance is hoped for, both because the meeting occurs in the heart of irrigation country, and also because of the interest which members have expressed in the proposed merger of the two irrigation groups.

A Student Pilgrimage

A STUDENT Chapter Conference will be held at Sacramento on Tuesday afternoon and evening, April 22, in connection with the Spring Meeting of the Society.

While the "magnificent distances" of the Far West may militate against a large attendance of students, it has been considered desirable to urge the attendance of as many as possible, and several stimulating replies have been received from rather remote institutions. This might be an excellent opportunity for near-by Local Sections to give the students encouragement toward a pilgrimage to the Conference.

On Tuesday afternoon they will be welcome at the Local Sections Regional Conference, after which supper is proposed, with special facilities for getting acquainted with the Officers and prominent members of the Society. An evening session will be devoted entirely to Chapter affairs.

It is hoped that Student Representatives will come all primed to discuss matters of interest to Chapter members, and that the Conference will contribute much to this phase of Society activity.

Interrelation

THE New York Sun recently addressed an editorial toward a certain subject supporting its argument by an enumeration of the following construction projects:

"The subway program will require commitments of $600,000,000 in addition to the $200,000,000 of work under contract but not yet performed."

"The Board of Transportation would require $110 000,000 in cash in 1930; $146, 000,000 in 1931 and $175,000,000 in 1932 to pay the contractors."

"The tri-borough bridge at an estimated cost of $32,000,000" (is proposed).

"The Thirty-eighth Street vehicular tunnel at an estimated cost of $86,000,000" (is proposed).

"The vehicular tunnel between Brooklyn and Staten Island at a cost of $78,000,000" (is proposed).

"The Delaware River water works project at a cost of $273,000,000" (is a commitment).

"The second deep tunnel for the Catskill supply will require $20,000,000 in cash in 1930, the same amount in 1931, and $12, 000,000 in 1932."

"A hospital program calling for $13,000, 000 in 1930 and $20,000,000 in 1931."

"New schools and sites which will require $42,000,000 in cash in 1930" (have been authorized).

"The new prison . . . is to be financed by the issue of $10,000,000 in bonds."

"The new Sanitation Department has been authorized to spend $10,000,000 this year."

"The city's share of the New York Central's West Side Improvement is estimated at $55,000,000."

"The sewage disposal plant on Ward's Island will cost approximately $38,000,000."

"Other public works of a miscellaneous character to the extent of several millions" (have been approved).

If any one fails to see the significance of the civil engineer to the community it is because he does not comprehend the inter-relation of the engineer and public works.

Jobs Worth Doing

LOCAL Sections are constantly seeking ways in which to be of service to the profession and to the public. Therefore a report of accomplishment along these lines is always of interest.

Among the progress reports of committees presented at a recent meeting of the San Francisco Section were two which are typical of this class. The Sub-Soil Committee has been collecting data on test borings, wells and piling, reports on subsidence, historical records and maps, and contemplates the issuance of a report during 1930 to include several maps and profiles.

The Building Committee has been working since 1925, jointly with other interested groups, in devising a new Building Code suitable for adoption throughout the State. The sub-committees have finished their recommendations, and the code is now in its editorial phase. The same Committee was active in securing the passage of the Civil Engineers' Registration Act, which was abstracted in the September, 1929, Proceedings, Part 2.

April Proceedings

ORDINARILY the Society does not indulge in continued stories in its publications. The first paper in the April Proceedings, however (by Clifford A. Betts, Member), seems to be an exception to this rule. Its very title, "Completion of Moffat Tunnel of Colorado", indicates this distinctive characteristic.

A previous and companion paper was entitled, "Construction Methods of Moffat Tunnel", by R. H. Keays, Member, and appeared several years ago (February, 1927). It began the interesting story and carried it through August, 1925. Not all the difficulties, however, had been overcome by that time, and the present paper carries the narrative forward to the completion of the tunnel in 1928. Aside from the instructive features of the construction itself, together with the unit costs, Mr. Betts details some interesting air flow tests, by means of which ventilation of the entire project was successfully provided.

The next paper entitled, "Frequency and Intensity of Successive Rainfalls at Boston, Massachusetts", by C. W. Sherman, Member, deals with a project which has been before the Society previously. Not only Mr. Sherman himself but the late Desmond FitzGerald, Honorary Member, has presented former studies. The present account is concerned with the fifty-year record. Thus in three papers a direct means is provided for comparing the advances in methods of studying rainfall data. In addition, Mr. Sherman now offers to the Profession some new and novel suggestions as to the proper arrangement, presentation, and interpretation of rainfall statistics.

Under the title, "The Shannon Power Development in the Irish Free State", A. R. C. Markl, Junior Member, describes clearly a new trend in construction practice as perfected by European engineers. Of special interest is his treatment of the problem of building embankments, particularly where he shows the adaptation of new and modern machinery to the various classes of earthwork.

Attention should also be drawn to a valuable report on "Ice as Affecting Power Plants", submitted by a Committee of the Power Division. This epitomizes current methods developed by engineers of long experience in dealing with this baffling question. Difficulties are analyzed and recommendations are made for handling troublesome ice problems. An extensive bibliography will be found of value to students of these matters.

Following this report appear 37 discussions on current papers relating to 18 topics. Finally, 7 memoirs of deceased members complete the April Proceedings.

You Can Help

THE Functional Expansion Program approved at the January Board meeting has begun to operate in at least one respect; and help is now asked of the members. The Public Educational Committee has met and formulated several possible procedures in connection with one of which it wants to make a collection of striking photographs of engineering works.

The Committee has in mind several possible uses of these pictures, but one proposal may assist in a visualization of the kind of picture wanted. The lantern-lectures which have recently been prepared at the suggestion of the Student Chapter Committee for circularization among the Student Chapters have demonstrated their value to such an extent that there is to be assembled one or more similar lantern-lectures to be directed at the general public and available for use by members before any interested audience.

They will differ from the Student lectures—instead of telling the story of a specific job they will tell the story of engineering, more particularly civil engineering, and therefore will cover all phases of that subject and need have no system of continuity.

Will members who can secure an interesting photograph send it in to Headquarters? The pictures must have character of interest to a layman; say they must be dramatic, or at least they must be self-evidently ingenious. Mere size or antiquity of the object will not suffice. The pictures must be self-evidently indicative of the works of an engineer or of the forces which he has to control. Each picture should be accompanied by the date as to project, location, history, etc., so that a few authentic remarks may be made concerning it.

By giving a few moments' thought almost every member can supply at least one such picture and many can supply several. Not all, of course, can be made use of in this way, but the choice must be left to the Committee in the light of its objectives, namely, the education of the public to the value of the engineer's services.

Weighted Ratings

IN a recent attempt to select a small group of the best engineers available for a certain task, the following scale of qualifications was applied:

1.	Soundness of judgment	17
2.	Probability of unbiased analysis	15...32
3.	Technical ability	12...44
4.	Experience with conditions in the region involved	12...56
5.	Industry and thoroughness	10...66
6.	Availability for continuous study	10...76
7.	Rating as a specialist	6...82
8.	Ability to work with others	6...88
9.	Professional standing	4...92
10.	Originality: production of ideas	4...96
11.	Age—maximum desirability, 50-60 years	2...98
12.	Knowledge of similar problems	2..100

It is interesting to note that Technical characteristics (3, 4, 7, 10 and 12) total 36%, while Personal characteristics (1, 2, 5, 8 and 9) add up to 52%. It should also be stated that these qualifications were sought in men of maturity, at the very peak of their professional careers, and that the men selected were to handle a problem of very great importance.

Freeman Scholarship

THE Traveling Scholarship made practicable through the generosity of Past-President John R. Freeman, is again available. There have been five recipients of this opportunity to study European hydraulic practice abroad: three in 1927, another in 1928, and one now abroad.

Briefly, a candidate shall be an American citizen, between the ages of 24 and 35, graduate of a technical institution of recognized standing, and now on the teaching staff of a technical school in which hydraulics is an important part of the curriculum. Membership in the Society is desirable but not mandatory.

He must speak, German, and have a proper background in mathematics and hydraulics. A photograph, six letters of reference, and certain other data will be required of the candidate.

The scholarship totals $1,600, of

which $500 is payable on July 1 and $100 a month thereafter for eleven months. Any expenses beyond this amount will be borne by the student, but under the economical living conditions abroad the scholarship should provide for at least the major items.

The latest date for filing an application is May 15, and the award will be made by the Committee on the Freeman Fund on or before June 1, 1930. Further information will be forwarded if desire.

An Engineering Report

(*Continued from page* 1)

of a French translation by Rondelet in 1820, and a German translation by Dederich in 1841, and had made Frontinus' story a hobby and pastime. In 1897 he made a special pilgrimage to the monastery, succeeded in having the 22½ pages of manuscript photographed, and two years later produced the first English translation. Longmans, Green & Co. published a second edition in 1913.

The volume contains photogravure reproductions of each manuscript page, followed by facing pages of the Latin text on the left and the literal English on the right. The work ends with several chapters of discussions and additional notes, with pictures of aqueducts, pipes, fixtures, etc.

Mr. Herschel disclaimed performing the actual translation himself. He compared the French and German versions, placed the discrepancies before competent Latinists, and finally interpreted the whole through his own wealth of hydraulic knowledge, which "in many places made him well-nigh independent of languages".

One cannot read any great amount of this book without feeling a brotherly kinship with the honest engineer who wrote the original report 1840 years ago. In fact, the text is fairly loaded with comments which, even in exact translation, might have been lifted from a modern treatise on a similar subject.

As a reminder to those already acquainted with Frontinus, and as an appetizer to those who should read it some day, a few of the paragraphs are here appended:

"I consider it to be the first and most important thing to be done, as has always been one of my fundamental principles in other affairs, to learn thoroughly what it is that I have undertaken."

"The Marcian conduit has a length of 61,710½ paces from the intake to the city; 54,247½ paces of underground conduit; 7463 on structures above-ground." . . .

"The river flows muddy and discolored even without the effect of rainstorms, and for this reason a settling reservoir was built upstream from the intake, so that in it and between the river and the conduit the water might come to rest and clarify itself."

"I also had plans made of the aqueducts from which it may be seen where there are valleys and how wide they are, and where rivers have been crossed."

"Of these waters, six are drawn into covered catch-basins . . . in which, resting as it were from their run and taking a new breath, they deposit their sediment. Their volume is also determined by gauges set up in these basins."

"Let us not forget that every stream of water whenever it comes from a higher point and flows into a delivery tank through a short length of pipe, not only comes up to its measure, but yields, moreover, a surplus; but whenever it comes from a low point, that is, under a less head, and is conducted a tolerably long distance, it will actually shrink in measure by the resistance of its own conduit."

"But a considerable quantity of water is lost through leaks in the conduit, which is not readily seen on account of the depth at which the conduit is located, but whose existence may be inferred from the circumstance that in many wards of the city excellent water is met with, which is the water that leaks from the conduits. But we have also found illicit pipes within the city. Outside the city, on the other hand, on account of the water level, which at the intake is fifty feet under ground, the conduit has suffered nothing unlawful."

"In all parts of the city also, the basins, old and new, have been connected for the greater part with two pipes of different aqueducts, so that if by any accident the supply of one or the other should fail, they will get water from the other and the use of the basins be thus kept up."

There has been detected much fraudulent tapping of "the conduits, whence it comes that the public water-courses are brought to a standstill by private citizens, yea, for the watering of their gardens."

"Far away, and in all directions, run the (lead) pipes under the city pavements. I discovered that these pipes were furnishing water by special branches to all whom they passed and who had been able to arrange for it; being bored for that purpose here and there, by the so-called tappers; whence it came that only a small quantity of water reached the places of public supply. The amount of water gained in consequence of our abatement of this evil, I measure by means of the fact that we have gathered a large quantity of lead by the removal of that kind of branch pipes."

"Repairs of masonry work should be executed at the right time, and conscientiously. The proper time for masonry work is from the 1st of April to the 1st of November; but with this restriction: that the work be interrupted during the hottest part of the summer; because moderate weather is necessary for the masonry properly to absorb the mortar, and to solidify into one compact mass; for the heat of the sun is no less destructive to masonry than is too violent a frost."

"Our forefathers with their admirable equity . . . in the construction of the aqueducts paid for the whole field in those cases in which the proprietors made any difficulty in the sale of a portion of the field, and after enclosing the needed portion again sold the (remainder of the) field."

◆ ◆ Miscellany ◆ ◆

The ballot on two proposed amendments to the Constitution was canvassed at a meeting of the Society in New York at 8:00 P.M., March 19, 1930, both amendments being carried by the necessary affirmative vote of two-thirds of all ballots cast.

The first proposal was to reduce the number of meetings of the Board of Direction from five to four. The other amendment was to change the number of Directors from 18 to 19 and to make the appropriate adjustment in districts.

The approach of the 1930 National Census brings a warning from American Engineering Council. Only four classes of technical engineers will be counted: civil, electrical, mechanical, and mining. Enumerators will be instructed that unless the engineer reports himself under one of the above headings, he will be listed as an operating engineer—such as locomotive, stationary or steam-shovel engineer. Hence the warning—be sure that your family or your landlady is properly instructed.

In addition, the engineer will be asked in what industry, or in what place, he is employed, such as his own business, consulting service, highways, city government, electric power plant, contracting service, etc. Replies should be very definite, in order to permit proper classification.

Members who read carefully the program of the Annual Meeting last January may remember the notices of reunion dinners for half a score of college groups. The enthusiasm of these groups led to an inquiry as to how many attended, with the following result:

Brown	95
Clarkson	90
Columbia	48
Cornell	94
Dartmouth	72
Illinois	31
New York University	44
Pennsylvania	45
Union	50

The busy President of a flourishing Local Section uses Part 2 of Proceedings as a source of topics for discussion at regular Section lunches. In fact, he complains that between routine Section business and the discussion of ideas thus aroused, his own lunch generally begins and ends with the soup, while the other members eat, listen and comment more or less simultaneously.